

VI.—*On the Uses of the Sand-canal in the Starfishes.* By THOMAS WILLIAMS, M.D., F.L.S., Physician to the Swansea Infirmary.

To the Editors of the Annals of Natural History.

GENTLEMEN,

Swansea, Dec. 22, 1856.

I HAVE recently accidentally fallen upon a very simple experiment, which brings directly under the eye at least *one* of the functions of the "Sand-canal" of the Asteriadae. Let a specimen of the familiar *Asterias rubens* in the fresh state be allowed to creep gradually from the bottom up the sides of a dish, and then pour into the dish *very slowly* fresh salt water; proceed until the *level of the water* accurately corresponds with the inferior (as the specimen is placed) edge of the "eye," or the madreporiform tubercle, which is the external outlet of the sand-canal. Now fix the attention upon the smooth calm surface of the water. In a moment or two a powerful current will be observed. It commences at the eye or madreporiform tubercle, and travels in enlarging waves towards the sides of the vessel. In a minute or two more the phænomenon occurs again, and again and again at rhythmic periods. Now fix the eye intently upon the surface of the water in the vicinity of the "tubercle," in order to discover whether, during the *intervals* between these rhythmic currents, a *contrary* movement of the water takes place, that is, whether an *ingoing* alternates with the outgoing current. Try the experiment under every possible variation of circumstances, and you will convince yourself that it *does not take place*. The function of the eye or madreporiform tubercle then is to *discharge* externally from time to time the contents of the ambulacral or water-vascular system of *Asterias*.

If analogy may guide the reason, the *outlet* of the sand-canal of *Asterias* should be viewed as the exact equivalent of the "*fissures*" in the neck of the Nemertine Annelids, which, as I have recently *proved* (Dr. Carpenter first *conjectured* the fact), open in a *peculiar manner* into the vascular system. I could not rest satisfied until I had *tried* the question, whether the water entered into or issued from these "*fissures*." I placed an individual of the species—*Polia* (*P. quadrioculata*)—in a flat glass-cell under the microscope, and watched with very fixed gaze the neighbourhood of the fissures. I ascertained with perfect certainty that from time to time an *emission* of fluid takes place at these points; but in no instance could I satisfy myself that any *inspiration* of fluid from without succeeded to the *expiration*. From these and other reasons I have ventured to deduce the following conclusions:—

1. That the sand-canal is intended from time to time to *discharge* externally the fluid contents of the ambulacral system of tubes.

2. That the ambulacral or water-vascular system of those Echinoderms in which it exists, is a modification of a *part* or the whole of the so-called blood-vascular system of the Annulose families in general.

3. That in both the former and in the latter instances the fluid contained in the vascular system is *derived by absorption* from the cavitory fluid.

In a paper lately laid before the Royal Society I have described an organ in the Annulose and Radiated classes, which I have ventured for the present to call the "Segmental organ," and which is to the "*cavitory fluid*" what the madreporiform tubercle in *Asterias*, and the cervical fissures in the Nemertidæ, are to the contents of the vascular system. *Both* are provisions for the *immediate* and *direct excretion* of the *entire body of the nutritive fluids*. These facts prove that as we descend the scale of animal life, the mechanism of the physiological act of "*secretion*" is simplified in the ratio in which the fluids and solids of the living body themselves are simplified!

I remain, Gentlemen, your obedient servant,

THOMAS WILLIAMS, M.D., F.L.S.

VII.—*Remarks on the Inferior Oolite and Lias in parts of Northamptonshire, compared with the same Formations in Gloucestershire.* By the Rev. P. B. BRODIE, M.A., F.G.S.

HAVING, at a late meeting* of the Cotteswold Naturalists' Club, given a *vivâ voce* account of the Inferior Oolite and Lias in a part of Northamptonshire; at the request of the Secretary, I have prepared a more detailed description for our 'Proceedings.' It is well known that certain beds in the Inferior Oolite in the neighbourhood of Northampton have been extensively worked for the ironstone which largely prevails in it thereabouts, though I believe it is not now so generally used for œconomical purposes as it was formerly. This was certainly the case with those quarries which I examined near Blisworth. They are not worked to any great depth, and occupy the higher ground in the district; the strata consist of sandy ferruginous oolitic stone containing a few imperfect casts of shells, though the greater part of the mass is unfossiliferous: the top beds are coarse, and contain impressions of shells; the lower ones are more compact, and are composed chiefly of ironstone. The Inferior Oolite

* Held at Cheltenham in August 1856.